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ABSTRACT

Standard, common electric typewriters are not completely suited to the needs of a high-level quadriplegic typing with a mouthstick. Experiences show that for complete control of a typewriter a mouthstick user needs the combined features of one-button correction, electric forward and reverse indexing, and easy character viewing. To modify a self-correcting typewriter for the electric indexing, the Rehabilitation Engineering Department of the Woodrow Wilson Rehabilitation Center used an electric solenoid connected to the platen and controlled by an electric switch on the typewriter face. The redesign proved effective and inexpensive to implement. Elevating the rear of the typewriter and angling the face of it toward the viewer in the wheelchair remedied the problem of seeing the characters. The Center's engineering department worked with a local distributor of the Royal 5000C self-correcting electric typewriter to produce a feasible design incorporating these features. A typewriter for a quadriplegic individual who types with a mouthstick is now commercially available at a cost approximately $200 more than the standard model. (Some photos and drawings of modifications are included.) (YLB)

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TYPEWRITER MODIFICATIONS FOR PERSONS WHO ARE HIGH-LEVEL QUADRIPLEGICS*

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Introduction

Quadriplegic individuals encounter numerous problems in communication. For a high-level disability with lost function below the shoulders, writing activity proves most difficult. A number of quadriplegics make use of the mouthstick to actuate the keys of an electric typewriter for printed communication. A high-level quadriplegic typing with a mouthstick quickly discovers that standard, common electric typewriters are not completely suited to his needs, since a number of modifications to the standard electric typewriters are needed for complete control by this patient.

Development

Experiences at Woodrow Wilson Rehabilitation Center have shown that when the quadriplegic typist succeeds in loading paper into the typewriter, he encounters further problems with correcting mistakes and reverse indexing the paper on the platen in the review of the typed copy. When only a mouthstick interface is available for the patient, correcting can be accomplished by using a one-button, self-correcting typewriter. A survey of the standard typewriters available shows that only a few of them have this self-correcting feature. Although the self-correcting feature is a help, it alone is not sufficient since even after the mouthstick user is able to correct mistakes, he still needs the ability to both advance and reverse the movement of the paper through the typewriter roller. On some typewriters, advancing paper is achieved by the forward index key, however, hand function is necessary to reverse the platen.

For complete control of a typewriter, a mouthstick user needs the combined features of one-button correction, electric forward and reverse indexing, and easy character viewing.

Paper Control

A simple, inexpensive adaptation to provide electric reverse indexing for an electric typewriter was designed and fabricated by the Rehabilitation Engineering Department at Woodrow Wilson Rehabilitation Center. The prototype version made use of an electric solenoid connected to the platen and controlled by an electric switch mounted on a typewriter face (Figure 1).

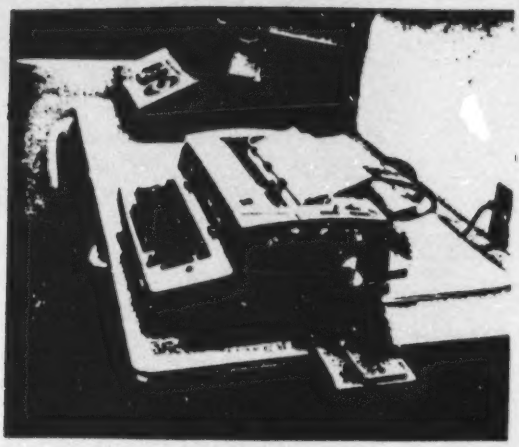

Figure 1 Prototype version of reverse indexing mechanism showing modifications to the right side of the platen.

The revised model used a motor that could easily be connected to an IBM self-correcting, Selectric typewriter. This modification incorporated a gear motor that was operated by two momentary contact switches that were mounted on the cover of the typewriter (Figure 2 and Figure 3).

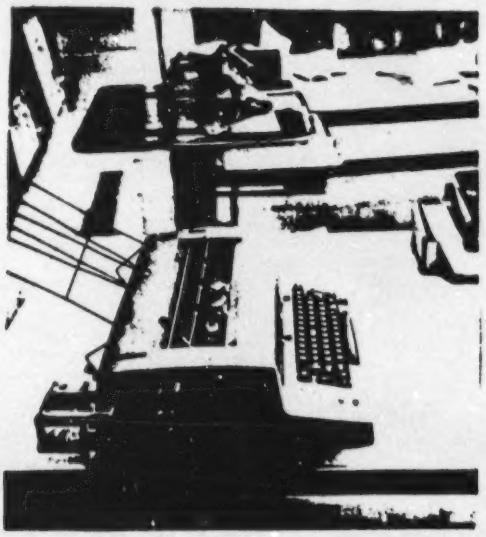

Figure 2 Self-correcting typewriter with simplified add-on unit to provide electric, reverse indexing. The modified motor is shown in the left rear and the control buttons are on the left front corner of the typewriter.

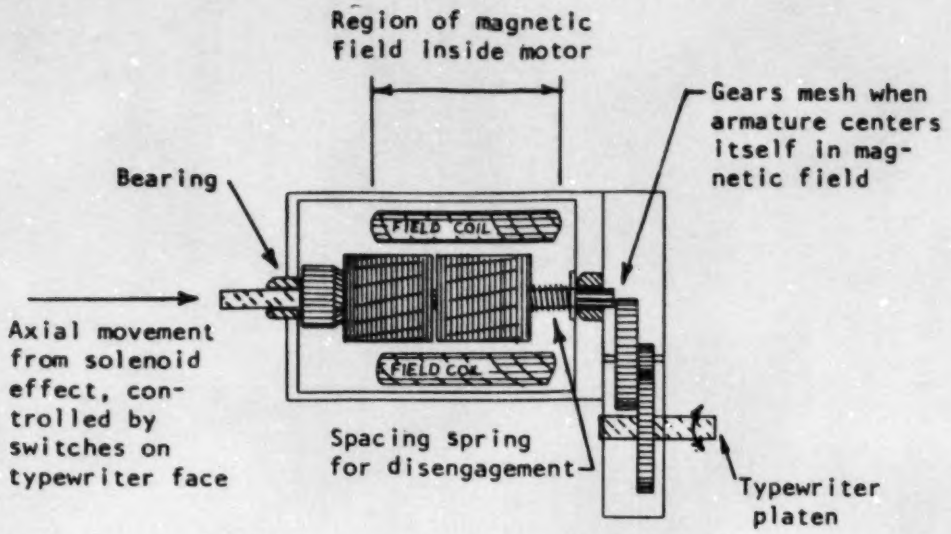
Region of magnetic field inside motor
Gears mesh when armature centers itself in magnetic field
Bearing
FIELD COIL
FIELD COIL
Axial movement from solenoid effect, controlled by switches on typewriter face
Spacing spring for disengagement
Typewriter platen

Figure 3 Schematic representation of motorized indexing mechanism.

The motor was altered allowing the shaft to rotate freely when the motor was not energized. This permitted forward indexing by use of either the electric index button or by the manual indexing knob on the opposite end of the platen. Only a few other minor modifications to the typewriter were needed to complete the revisions for electric forward and reverse indexing. The redesign did not interfere with any of the existing functions of the typewriter and proved effective and inexpensive to implement. The cost of materials were approximately $80 and the construction required minimum fabricating ability.

Character Viewing

After the mouthstick user had access to forward and reverse manipulation of the platen and correcting ability, he then experienced difficulty in seeing the characters being typed. A high-level quadriplegic does not have upper trunk stability and is, therefore, unable to lean forward (as would a non-handicapped individual) to observe the characters. A simple remedy to this problem was to elevate the rear of the typewriter, angling the face of it toward the viewer in the wheelchair.

Results

These typewriter revisions proved to be successful enough for a manufacturer to incorporate them into an existing commercial product. Design limitations of existing typewriters suggested that the modifications may be least extensive when applied to a Royal 5000C, self-correcting electric typewriter. The Rehabilitation Engineering Department at Woodrow Wilson Rehabilitation Center worked with a local distributor to produce a feasible design incorporating these features. As a result, there is now a typewriter commercially available that permits full access to a typewriter for a quadriplegic individual who types with a mouthstick.

The final product is a compact, functional, and aesthetically pleasing item. The only visible modifications are the forward and reverse indexing button shown at the bottom, right-hand corner of the typewriter in Figure 4. The cost is only $200* more than the standard model.

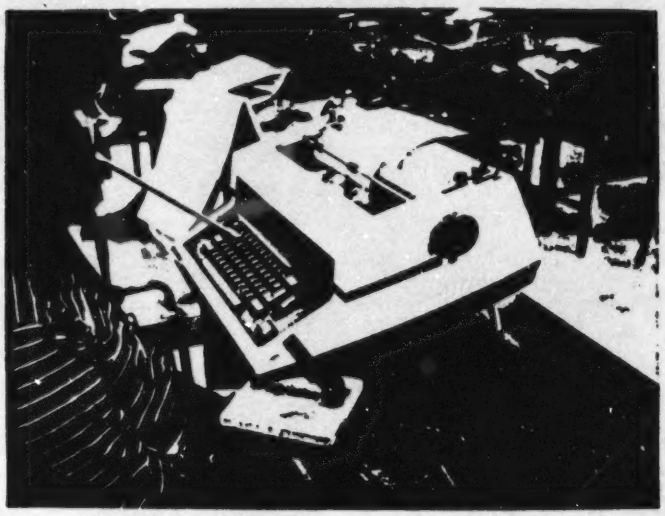

Figure 4 Final Result: Commercially available typewriter with one button correction, forward and reverse indexing, and easy character viewing.

The expected benefit of this style of typewriter is large. Every quadriplegic who types with a mouthstick can benefit from this design. There are a few elaborate, expensive typewriting systems that also provide these types of features.[1,2,3,4] However, this final product including the typewriter with the revisions is available for less than $950. This design increased the ability of a handicapped individual to function independently for a realistic price.

* Prices may vary depending on quantity, shipping charges, or discount schedule for State agencies.

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